BULLETIN

OF THE INSTITUTE OF METALS

VOLUME 1 FEBRUARY 1952 PART 6

INSTITUTE NEWS

Annual General Meeting, London, Monday–Thursday, 24–27 March 1952

THE 1952 Annual General Meeting will be held in London from Monday to Thursday, 24–27 March, inclusive. All the scientific and technical discussions will be held at the Park Lane Hotel, at which a luncheon and a dinner-dance will also be held. As recommended by the Meetings Sub-Committee, the "May" Lecture will be delivered (at the Royal Institution) on the evening of the first day of the meeting, while on another evening an inexpensive and informal conversazione will be held at 4 Grosvenor Gardens. Visits to works and laboratories are being arranged in connection with the meeting.

An innovation will be the holding of simultaneous scientific and technical sessions on widely differing subjects.

The programme of the meeting is believed to be varied and attractive, and it is hoped that there will be a large attendance of members and visitors. Those requiring hotel accommodation in London are advised to make early bookings.

PROGRAMME

Monday, 24 March

6.0 p.m.—Forty-Second Annual May Lecture, by Dr. J. J. P. STAUDINGER on plastics, in the Lecture Theatre of the Royal Institution, Albemarle Street, London, W.1.

Tuesday, 25 March

Location: Park Lane Hotel, Piccadilly, W.1. (Tudor Room).

10.30 a.m.—Business meeting.
Report of Council.
Report of the Honorary Treasurer.
Induction of the new President, Dr. C. J. Smithells, M.C., F.I.M.
Votes of thanks to retiring officers.
PRESIDENTIAL ADDRESS, BY DR. C. J. SMITHELLS

12.0 noon.—Adjournment; drinks will be served in an ante-room.

1.0 p.m.—LUNCHEON (tickets 18*s.* 6*d.*, including coffee and gratuities, but exclusive of drinks).
Presentation of:
(*a*) The Institute of Metals (Platinum) Medal.
(*b*) The W. H. A. Robertson Medal.
(*c*) The Rosenhain Medal.

2.30 p.m.—Adjournment.

2.45 p.m.—Scientific Session. The following papers (the references are to the *Journal*) will be discussed:

(1) Jointly: ELLWOOD and WEDDLE: "The Production and Properties of Oxide-Reduced Copper Powder" (No. 1342; Jan. 1952); BUTLER and HOAR: "Unrelated Simultaneous Interdiffusion and Sintering in Copper–Nickel Compacts" (No. 1343; Jan. 1952); and HOWAT, CRAIK, and CRANSTON: "The Sintering of Copper–Zinc Powder Compacts" (Mar. 1952).

(2) BENSON, MCKEOWN, and MENDS: "The Creep and Softening Properties of Copper for Alternator Rotor Windings" (No. 1333; Nov. 1951).

5.0 p.m.—Adjournment.

7.0 for 7.30 p.m.—DINNER-DANCE, at the Park Lane Hotel, Piccadilly, London, W.1. *Dress:* Evening dress, with decorations. (Tickets, price 30*s.* each, inclusive of coffee and gratuities, but exclusive of drinks.)

Wednesday, 26 March

Two concurrent scientific and technical programmes.

Programme "A"

Location: Park Lane Hotel, Piccadilly, W.1. (Tudor Room).

9.30 a.m.—SYMPOSIUM ON "EQUIPMENT FOR THE THERMAL TREATMENT OF NON-FERROUS METALS AND ALLOYS", arranged by the Metallurgical Engineering Committee. An all-day general discussion, based on the following papers published in the Feb. 1952 issue of the *Journal*:

(1) EVANS, HANCOCK, HAYWOOD, and MCMULLEN: "Electric Furnaces for the Thermal Treatment of Non-Ferrous Metals and Alloys".

(2) WAIGHT: "Gas Equipment for the Thermal Treatment of Non-Ferrous Metals and Alloys".

(3) DAVIS and TEMPLE: "Batch and Continuous Annealing of Copper and Copper Alloys".

(4) HARTLEY and BRADBURY: "Bright Annealing of Nickel and Its Alloys".

(5) PATON: "Batch Thermal Treatment of Light Alloys".

(6) STAPLES: "Flash Annealing of Light Alloys".

(7) LAMOURDEDIEU: "Continuous Heat-Treatment of Aluminium Alloys of the Duralumin Type",

12.45 p.m.—Adjournment.
2.30 p.m.—Symposium resumed.
5.0 p.m.—Conclusion of symposium.

Location: 4 Grosvenor Gardens, S.W.1.

8.0 p.m.—CONVERSAZIONE and Exhibition. Guests will be welcome. *Dress:* Lounge suits. (Tickets, price 3*s.* 6*d.*, inclusive of light refreshments.) The Secretary will be glad to receive offers of suitable exhibits.

Programme "B"

Location: Park Lane Hotel, Piccadilly, W.1. (Smoke Room).

9.30 a.m.—Scientific session. The following papers (references are to the *Journal*) will be discussed:

(1) TABOR: "The Hardness and Strength of Metals" (No. 1294; Mar. 1951).

(2) Jointly: MCQUILLAN (A. D.): "Some Observations on the α-β Transformation in Titanium" (No. 1279; Nov. 1950); MCQUILLAN (A. D.): "The Application of Hydrogen Equilibrium-Pressure Measurements to the Investigation of Titanium Alloy Systems" (No. 1298; Apr. 1951); WORNER: "The Constitution of Titanium-Rich Alloys of Iron and Titanium" (No. 1304; May 1951); MCQUILLAN (A. D.): "The Titanium–Hydrogen System for Magnesium-Reduced Titanium" (No. 1311; July 1951); MCQUILLAN (M. K.): "A Provisional Constitutional Diagram of the Chromium–Titanium System" (No. 1312; July 1951); KARLSSON: "An X-Ray Study of the Phases in the Copper-Titanium System" (No. 1313; July 1951); JENKINS and WORMER: "The Structure and Some Properties of Titanium–Oxygen Alloys Containing 0–5 At.-% Oxygen" (No. 1337; Dec. 1951); WORNER: "Heat-Treatment of Titanium-Rich Titanium–Iron Alloys" (No. 1344; Jan. 1952); and MCQUILLAN (A. D.): "The Effect of the Elements of the First Long Period on the $\alpha \rightleftharpoons \beta$ Transformation in Titanium" (Mar. 1952).

12.45 p.m.—Adjournment.
2.30 p.m.—Scientific session. Discussion of the following papers:

(1) Jointly: PERRYMAN and BROOK: "Mechanism of Precipitation in Aluminium–Magnesium Alloys" (No. 1295; Mar. 1951); SWAIN: "Experiments on the Reaction of Aluminium–Magnesium Alloys with Steam" (No. 1332; Nov. 1951); and EDELEANU: "A Mechanism of Stress-Corrosion in Aluminium–Magnesium Alloys" (No. 1341; Dec. 1951).

(2) HARDY: "The Ageing Characteristics of Binary Aluminium–Copper Alloys" (No. 1310; July 1951).

5.0 p.m.—Conclusion of session.

Location: 4 Grosvenor Gardens, S.W.1.

8.0 p.m.—CONVERSAZIONE and Exhibition. Guests will be welcome. *Dress:* Lounge suits. (Tickets, price 3*s.* 6*d.*, including light refreshments.) The Secretary will be glad to receive offers of suitable exhibits.

Thursday, 27 March

Two concurrent programmes.

Programme "A"

10.0 a.m.—Visits to the following works. Transport will leave the Park Lane Hotel, Piccadilly, W.1, *promptly* at the time stated. Members only may be accepted for these visits, tickets for which can be obtained from the Secretary. As numbers for each visit are strictly limited, an order of preference should be stated when making application for a ticket. Price of ticket, 5*s.*, inclusive of transport.

(1) Ford Motor Co., Ltd., Dagenham. All-day visit; lunch price 6*s.* 6*d.*, including gratuities, at the Robin Hood Hotel.

(2) J. Stone and Co. (Charlton), Ltd., Charlton. (Morning visit; return to London for lunch.)

Programme "B"

Location: Park Lane Hotel, Piccadilly, W.1. (Tudor Room).

9.45 a.m.—Metal Physics session, arranged by the Metal Physics Committee. The following papers (references are to the *Journal*) will be discussed:

(1) *Theme: Fatigue.*

Jointly: WOOD and HEAD: "Some New Observations on the Mechanism of Fatigue in Metals" (No. 1299; Apr. 1951); and FORSYTH: "Some Metallographic Observations on the Fatigue of Metals" (No. 1340; Dec. 1951).

(2) *Theme: Plastic Deformation.*

Jointly: CAHN: "Slip and Polygonization in Aluminium" (No. 1302; May 1951); HONEYCOMBE: "Inhomogeneities in the Plastic Deformation of Metal Crystals" (No. 1324; Oct. 1951); and BROWN: "Slip Bands and Hardening Processes in Aluminium" (No. 1331; Nov. 1951).

12.30 p.m.—Conclusion of session.
2.15 p.m.—Visits to the following laboratories. Transport will leave the Park Lane Hotel, Piccadilly, W.1, *promptly* at the time stated. As numbers for each visit are strictly limited, an order of preference should be stated when making application for a ticket. Price of tickets, 4*s.* 6*d.*, including transport.

(1) British Iron and Steel Research Association Research Laboratories, Physics Department, 140 Battersea Park Road, S.W.11.

(2) General Electric Co., Ltd., Research Laboratories, Wembley.

(3) Mond Nickel Co., Ltd., Precious Metal Refinery, Acton.

Appeal to Industry for Regular Financial Support of the Institute's Work

The following additional contributions have been received in response to the Council's appeal to industry for regular financial support of the work of the Institute.

The Council will be grateful for subscriptions (particularly subscriptions under covenant, on which the Institute—as a "charity"—may recover income tax) and donations from those companies in the metallurgical and engineering industries which have not yet responded to this appeal.

A. Subscriptions to be Renewed Annually, Under Covenant, for Not Less Than 7 Years.

	Net. £ s. d.	Gross After Recovery of Tax by the Institute £ s. d.
Essex Aero, Ltd. .	25 0 0	47 12 4
Phosphor Bronze Co., Ltd., The .	10 10 0	22 12 4

B. Subscriptions to be Renewed Annually (Without Obligation), but Not Under Covenant.

Rhodesia Broken Hill Development Co., Ltd.	150 0 0*
Head, Wrightson and Co., Ltd. . . .	26 5 0
Lawley (Thomas), Ltd. and Jones and Rooke (1948), Ltd.	10 10 0*

C. Donations (Some of Which May be Renewed Annually).

Booth (James) and Co., Ltd. (incl. John Wilkes, Sons and Mapplebeck, Ltd.) . . .	100 0 0
Plessey Co., Ltd., The	25 0 0
Roe (A. V.) and Co., Ltd.	25 0 0
Delta Metal Co., Ltd. (incl. Heaton and Dugard, Ltd.)	21 0 0
Carborundum Co., Ltd.	10 10 0
Highton and Son, Ltd.	10 10 0
Johnson (Richard), Clapham and Morris, Ltd. .	10 10 0
Strebor Diecasting Co., Ltd.	10 10 0
West Yorkshire Foundries, Ltd. (subsidiary of Leyland Motors, Ltd.)	10 0 0
Jacks (William) and Co., Ltd. . . .	5 5 0
Rigby (John) and Sons, Ltd. . . .	5 5 0
Vincent Engineering Co., Ltd. . . .	5 5 0
Cambridge Instrument Co., Ltd. . . .	5 0 0
Mining and Chemical Products, Ltd. . .	3 3 0
Walterisation Co., Ltd. The . . .	3 3 0
Tungum Sales Co., Ltd.	2 2 0

* Promised as an "Annual" Donation.

Election of Members

The following 21 Ordinary Members, 3 Junior Members, and 9 Student Members were elected on 17 December 1951:

As Ordinary Members

ANDERSON, George Francis, Director and Secretary, The Anglo Metal Co., Ltd., 2 and 3 Crosby Square, London, E.C.3.

BROWN, Reginald William Hardwicke, Director and General Manager, William Hunt and Sons, The Brades, Ltd., Oldbury, nr. Birmingham.

CALVERT, Ernest, A.M.C.T., A.I.M., Experimental Officer, Ministry of Supply, Research and Development Branch, Culcheth, Warrington.

CASSY, Frank, Chief Chemist, Darwins, Ltd., Sheffield 9.

CHATTERTON, John Victor, Chief Research and Liaison Metallurgist, Central Research Laboratories, Radiation, Ltd., Aston, Birmingham 6.

COGITO, Giuseppe, Managing Director, Metallindustria, Via Lario 13, Milano, Italy.

EDWARDS, Ronald Alexander, Metallurgist, Johnson, Matthey and Co., Ltd., 78 Hatton Garden, London, E.C.1.

ENGERS, Meyer Coenraad, Director, M. C. Engers, Ltd., 40 Jasmine Grove, Penge, London, S.E.20.

FELDMANN, Heinz-Dietrich, Dr.-Ing., Kabel- und Metallwerke Neumeyer A.G., Nürnberg 2, Germany (U.S. Zone).

FOLDES, Stephen, B.A., L.I.M., Metallurgist, Yorkshire Copper Works, Ltd., Leeds.

GARLAND, John, Assistant Chief Metallurgist, Royal Ordnance Factory, Kings Meadows, Nottingham.

GENSAMER, *Professor* Maxwell, D.Sc., Professor of Metallurgy, School of Mines, Columbia University, New York 27, N.Y., U.S.A.

GREENOUGH, Geoffrey Blakeley, M.A., Ph.D., Lecturer, Metallurgy Department, University of Sheffield.

GRIS, Jean, Ing., Chief Engineer, Société Générale du Magnésium, 23 rue Balzac, Paris, France.

HUNDY, Bernard Brian, B.Sc., Ph.D., Scientific Officer, British Iron and Steel Research Association, Hoyle Street, Sheffield.

NICHOLLS, Edgar, Metallurgical Chemist, Earle, Bourne and Co., Ltd, Birmingham 18.

SNYDER, Clermont J., B.S., Supervisor, Metallurgical Laboratory, Anaconda Wire and Cable Company, Hastings-on-Hudson 6, N.Y., U.S.A.

WATSON, Neville John, Chief Inspector, Earle, Bourne and Co., Ltd., Birmingham 18.

WEAVER, Ronald James, Metallurgist, Earle, Bourne and Co., Ltd., Birmingham 18.

WEBB, A. Leonard C., Managing Director, Rola Company (Australia) Pty., Ltd., The Boulevard, Richmond, Vic., Australia.

WONG, Joshua Kin Hei, Chief Engineer, Trans-Continental Corporation of Brazil and South America, Ave. Rio Branco 173, Rio de Janeiro, Brazil.

As Junior Members

BATEMAN, (Mrs.) Catherine M., B.Sc., Assistant Experimental Officer, Metallurgy Department, Royal Aircraft Establishment, Farnborough, Hants.

JACKSON, Paul L., Scientific Laboratory, Metallurgy Department, Ford Motor Company, Dearborn, Mich., U.S.A.

RACHINGER, William Albert, M.Sc., Research Metallurgist, Aeronautical Research Laboratories, Ministry of Supply Box 4331, G.P.O., Melbourne, Vic., Australia.

As Student Members

BEDDOW, John Keith, Student of Metallurgy, University of Manchester.

BIGG, Anthony Philip, Student of Metallurgy, King's College, Newcastle-upon-Tyne.

COWLISHAW, Frank Reginald, Metallurgical Assistant (Laboratory), Hardy Spicers and Co., Ltd., Witton, Birmingham 6.

HOLLAND, Roy Norman, Student of Metallurgy, University of Manchester.

MCNEIL, William, Student of Metallurgy, King's College, Newcastle-upon-Tyne.

MELFORD, David Austin, Student of Metallurgy, University of Cambridge.

SMALE, John H. W., Student of Metallurgy, King's College, Newcastle-upon-Tyne.

TUCK, Charles William, Student of Metallurgy, University of Cambridge.

WALKER-MORECROFT, Anthony, Student of Metallurgy, University of Manchester.

The following 18 Ordinary Members, 2 Junior Members, and 35 Student Members were elected on 31 December 1951:

As Ordinary Members

BAUGH, Fred, Managing Director, Alexander Metal Co., Ltd., Bilston, Staffs.

BERGSTRÖM, Erik Victor, Chief of Tungsten Department, Lamalampan A.B., Stockholm, Sweden.

BROMMERT, Johannes Wladimir, B.Sc., Lecturer in Physics, University of Witwatersrand, Johannesburg, South Africa; temporarily at the Cavendish Laboratory, Cambridge.

CARR, Norman, Director, Samuel Gratrix, Ltd., Quay Street, Manchester 3.

CONRAD, Clarence K., A.B., B.S., Ch.E., Metallurgist, The American Metal Co., Ltd., 61 Broadway, New York 6, N.Y., U.S.A.

DICKISON, Raymond R., M.S., Librarian, Colorado School of Mines, Golden, Colo., U.S.A.

HERRINGTON, Hugh Geoffrey, Director and General Manager, High Duty Alloys, Ltd., 89 Buckingham Avenue, Slough, Bucks.

KEYS, Lewis Henry, Attached Scientist, Royal Aircraft Establishment, Farnborough, Hants.

LAWLER, Wilbert J., Chief Metallurgist, Kaiser Aluminum and Chemical Corporation, Trentwood Works, Spokane, Wash., U.S.A.

LEACH, James Stuart Llewelyn, B.Sc., Ph.D., Graduate Research Metallurgist, University of Birmingham.

LOOSEN, Stephen Philip, Managing Director, The Anti-Attrition Metal Co., Ltd., Maidenhead, Berks.

OSBALDISTON, Ernest, A.M.C.T., Works Manager, Samuel Gratrix, Ltd., Tenax Road, Trafford Park, Manchester.

PIONTELLI, *Professor* Roberto, Director of the Instituto di Elettrochimica, di Chimica Fisica e Metallurgica e di Metallurgia del Politecnico, Milano, Italy.

THOMPSON, George Arthur, Works Manager, Samuel Gratrix, Ltd., Lead Works, Philips Park Road, Manchester.

TONOLLI, Luigi, General Manager, A. Tonolli and Company, Milano, Italy.

TUI, Alfred Mengyun, B.Sc., Engineer, Meyer Manufacturing Co., Ltd., 313–315 Castle Peak Road, Kowloon, Hong Kong.

WESTWOOD, Joseph Frank, Chief Inspector, The South Wales Aluminium Co., Ltd., Rheola Works, Resolven, Glam.

WIJKANDER, Evert, Managing Director, AB Bofors, Bofors, Sweden.

As Junior Members

BETTINGTON, P. J., Assistant, Metallurgical Laboratory, Baxters, Ltd., Sheepcote Street, Birmingham 15.

BRANN, C. M. B., B.A., Trainee, Commercial Metal Co., Ltd., 66 Gresham Street, London, E.C.2.

As Student Members

ADAM, Roderic Walter, Student of Metallurgy, University of Cambridge.

AINSLIE, Alan, Student of Metallurgy, King's College, Newcastle-on-Tyne.

APPS, R. L., Student of Metallurgy, University of Birmingham.

ATKINS, R., Assistant Chemist, Metals and Alloys (Birmingham), Ltd., Minworth, nr. Birmingham.

BANKIER, Alexander Martin, Student of Metallurgy, King's College, Newcastle-on-Tyne.

BASSETT, Keith Terence, Student of Metallurgy, King's College, Newcastle-on-Tyne.

BELL, Ronald L., B.Sc., Research Student, University of Birmingham.

BERMAN, Abraham, M.Sc., Postgraduate Student of Industrial Metallurgy, University of Birmingham.

BLEWDEN, Henry Jeffrey, B.Sc., Student of Metallurgy, University College of South Wales and Monmouthshire, Cardiff.

BULLOCK, Bernard, Student of Metallurgy, University of Birmingham.

COOPER, Geoffrey Leonard, B.Sc., Postgraduate Student of Physical Metallurgy, University of Sheffield.

GANE, Nicholas, Student of Metallurgy, King's College, Newcastle-on-Tyne.

GIBBON, Ronald Bryan, Student of Metallurgy, King's College, Newcastle-on-Tyne.

HALL, James Logan, Jr., Student of Metallurgy, Royal Technical College, Glasgow.

HARRIS, J. E., Student of Metallurgy, University of Birmingham.

HIGHAM, Sheila Margaret, B.Eng., Research Student, University of Liverpool.

HORNE, Campbell C., Student of Metallurgy, Royal Technical College, Glasgow.

HOWD, Derrick, Student of Metallurgy, King's College, Newcastle-on-Tyne.

HUGHES, Alan Gray, Student of Metallurgy, University of Birmingham.

KING, Hubert Wylam, Student of Metallurgy, University of Birmingham.

LEE, James Arthur, B.Sc., Research Student, University of Birmingham.

LINES, Anthony Hillesden, Student of Metallurgy, University of Cambridge.

MCNAIR, David Bruce, Jr., Student of Metallurgy, University of Birmingham.

MARRIOTT, James Bruce, B.Sc., A.R.T.C., Metallurgy Research Student, Royal Technical College, Glasgow.

MOELWYN-HUGHES, Arthur Alun, Student of Metallurgy, University of Cambridge.

NAOR, Pinchas, Ing., Postgraduate Student of Metallurgy, University of Birmingham.

POTTER, Vernon Carl, Student of Metallurgy, Missouri School of Mines, Rolla, Mo., U.S.A.

RAYSON, Harry William, B.Sc., Research Assistant, Department of Theoretical Metallurgy, University of Birmingham.

RUSHTON, Ronald, Student of Metallurgy, University of Birmingham.

STACEY, Ronald Denis, Student of Metallurgy, University of Birmingham.

THICKETT, Gordon Allan, Student of Metallurgy, Royal Technical College, Glasgow.

TURNER, Brian Foster, B.Sc., Postgraduate Student of Metallurgy, University College of South Wales and Monmouthshire, Cardiff.

WALLETT, John Keith, Assistant, Metallurgical Laboratory, F. H. Lloyd and Co., Ltd., James Bridge Steel Works, nr. Wednesbury, Staffs.

WRIGHT, Robert Wilfred Ashby, Assistant Metallurgist, Tubes, Ltd., Rocky Lane, Aston, Birmingham 6.

WYLIE, Bryan H., Student of Metallurgy, Royal Technical College, Glasgow.

Students' Educational Tour, Easter Vacation 1952

An Educational Tour for Junior Members and Student Members of the Institute is being arranged, for a week during the Easter vacation, in the South Lancashire area.

It is hoped that firms in the industry will encourage, and assist, young men on their staffs to take part in this tour. University and Technical College lecturers may accompany their students.

Full particulars will be published as early as possible. The cost will not exceed £7 per head, inclusive of accommodation, meals, local transport, and gratuities.

PERSONAL NOTES

Mr. B. S. Barham has left Dewrance and Co., Ltd., and has been appointed research metallurgist to M. B. John, Ltd., Ballarat, Vic., Australia.

Mr. R. P. Bradshaw has left Cambridge University and is now with Associated Lead Manufacturers, Ltd., Chester.

Mr. T. Broom has returned to England from Australia to take up an appointment as Research Fellow in Metallurgy at Birmingham University.

Mr. A. R. Chaudhuri has left Manchester University and is now in the Metallurgy Department, Massachusetts Institute of Technology.

Mr. B. R. Coles has been awarded the degree of D.Phil. of Oxford University.

Professor Pol Duwez has recently spent several weeks in Europe studying the metallurgy of titanium on behalf of the U.S. Army Ordnance Corps.

Mr. R. P. P. Ellis has left Rediffusion, Ltd., and is now development metallurgist with the Plessey Co., Ltd., Towcester, Northants.

Mr. W. W. Franklin, Chief Engineer of Davy and United Engineering Co., Ltd., has been appointed a Director of the Company.

Mr. A. B. Graham has accepted an invitation to join the Delegate board of Henry Wiggin and Co., Ltd.

Dr. S. Harper has returned from America, where he held a fellowship from the Union Carbide and Carbon Corporation at the Institute for the Study of Metals, Chicago, and has been appointed an investigator in the General Metallurgy Section of the British Non-Ferrous Metals Research Association.

Mr. G. T. Harris has been appointed Research Director of William Jessop and Sons, Ltd., Sheffield, not Research Manager as stated in the October 1951 issue of the *Bulletin*. Mr. Harris had, in fact, been Research Manager since 1947.

Mr. R. Haynes has recently received the degree of Ph.D. of Sheffield University.

Mr. F. O. Jones has resigned his post as Assistant Lecturer at University College, Swansea, and has rejoined the staff of the A.E.I. Research Laboratory, Aldermaston, as a research metallurgist.

Mr. J. E. Owston has been appointed Managing Director of Cravens Railway Carriage and Wagon Co., Ltd., Sheffield.

Mr. A. L. Sutton has left Cambridge University and is now a research assistant in the Inorganic Chemistry Laboratory, Oxford.

Mr. J. G. Walford has left the British Iron and Steel Research Association to take up an appointment as physicist in the Research and Engineering Department of S. Smith and Sons (England), Ltd., Bishops Cleeve, near Cheltenham.

New Year Honours

We offer our congratulations to the following members whose names appeared in the New Year Honours List :

Mr. G. L. Bailey, Director, British Non-Ferrous Metals Research Association (C.B.E.).

Mr. H. H. Burton, Director, English Steel Corporation, Ltd. (C.B.E.).

Dr. Harold Hartley, Chairman, Radiation, Ltd. (C.B.E.).

Mr. J. W. R. Naden, Chief Metallurgist, Chesterfield Tube Co., Ltd. (M.B.E.).

Mr. R. T. Rolfe, Chief Metallurgist, W. H. Allen Sons and Co., Ltd. (O.B.E.).

OBITUARY

Mr. J. D. Ellis

As already briefly reported, Mr. John Devonshire Ellis died on 31 August 1951, in his 68th year.

The eldest son of Arthur Devonshire Ellis and grandson of John Devonshire Ellis, a former Chairman and Managing Director of the well-known shipbuilding firm of John Brown and Co., Ltd., Mr. Ellis was educated at Lancing College and Leeds University. He served his time in his father's works, Thwaites Bros., and became a metallurgical engineer. Before and after the First World War, during which he served in the War Office, Mr. Ellis inspected railway material for Rendel, Palmer, and Tritton, consulting engineers, in Manchester and London, and from 1924 to 1928 at Krupps, Essen.

In 1929 he became London Manager of the Birmingham Battery and Metal Co., Ltd., a position he held until his retirement in 1950, when he went to live at Lavant in Sussex. His recreations included climbing, pot-holing, walking, and travel.

Mr. Ellis was elected a member of the Institute in 1930.

Mr. G. H. Rogers

The death was announced on 22 November 1951, of Mr. George Harry Rogers, B.Sc., F.I.M.

Mr. Rogers, who was in his 62nd year, spent the whole of his working life in the service of the Metals Division of Imperial Chemical Industries, Ltd., and its predecessors. Joining the King's Norton Metal Co. in 1904, he became Assistant Works Manager nine years later. Another spell at King's Norton—this time as Works Manager—broke twenty-five years' service at the Division's Kynoch Works, where he ultimately became production manager for strip and sheet manufacture. In 1946 he was appointed regional production manager of the Division's three factories in South Wales.

Throughout his long career in the non-ferrous industry, Mr. Rogers retained two special interests—in the manufacture of coins, for which the King's Norton Metal Co. was noted, and in the development of wrought aluminium alloys.

Mr. Rogers had been a member of the Institute since 1917.

Local Section Paper

THE TRAINING AND STATUS OF METALLURGISTS* B1

By R. CHADWICK,† M.A., F.R.I.C., F.I.M., MEMBER

SYNOPSIS: Metallurgical training in Great Britain and the steps to expand existing facilities to meet present-day demands are briefly reviewed, together with the requirements of scientific education in general. The alternative careers open to the qualified metallurgist are discussed, and the pattern of older professional bodies examined in relation to metallurgical status and practice. Finally, a plea is advanced for encouraging a wider interest in metallurgy in non-scientific circles.

Introduction

THE ever-increasing scale of operation and complexity of individual processes in all branches of industry has led, particularly in the last few years, to a demand for trained technologists, scientists, and managerial staff, and for a higher standard of education, even in the factory worker, which can hardly have been anticipated when our schools, technological institutes, and universities were founded and developed to their present status. In past years metallurgy was relegated to a position of relative obscurity, but the number of industries now employing metals as the major material of construction makes it evident that metallurgical science can be neglected only at the cost of efficiency in plant design and performance. The steps suggested to raise the standard of education generally,[1] and to increase the facilities for higher technological and scientific training in particular,[2–5] are therefore of special significance to members of the Institute of Metals.

Education

Possibly because of the omission of their subject from school curricula, metallurgists have paid little attention to scientific training in primary and secondary schools. Chemists [6, 7] and physicists who have studied this matter, however, report that the post-war changes in the educational system are for the most part retrograde, the tendency being to spread the teaching of science over a broader field, with less attention to detail. The reduced emphasis on the written examination tends to foster a superficial approach to knowledge, and fails to provide that early training of the mind so essential to those who take up a subject in which physical and mathematical concepts are of ever-increasing importance.

Some improvement has been achieved in the facilities for higher education in both universities and technical colleges by the re-organization and expansion of existing departments and by the creation of new ones. O'Neill [8] has written a comprehensive account of the opportunities available in Great Britain for higher education in metallurgy, and Hanson [9] and Wright [10] have discussed in a more detailed manner the curriculum in a typical metallurgical department. It is evident that the needs of our great engineering industries for trained personnel, comparable in ability to those on whom competitive industries are able to draw in America, and with the advantages of the same standard of training, have yet to be met.

The scope of higher technological education in the United States has been expounded by Chipman,[11] who describes the broad principles of the metallurgical course at the Massachusetts Institute of Technology, and by Bever and Floe,[12] who examine the curriculum in greater detail. The methods and standard of teaching are in many ways similar to those of our own university metallurgical faculties, as described by O'Neill, Hanson, and Wright. The initiation of an original piece of research, followed by the writing of a thesis, is claimed to form an important part of the programme of study at the Massachusetts Institute of Technology.

The value of the great technological universities of the Continent and America, and the need for establishing similar centres of higher education in this country, have been discussed in a recent series of articles in the *Times Educational Supplement*.[13] The distinguishing character and chief aim of these important centres of education are defined in the concluding article by Principal Killian of the Massachusetts Institute of Technology. The institute of technology is essentially a school of engineering, using that word in its broadest sense, and its duty is to prepare men for a career in industrial technology, whether that be research in the sciences, pure engineering, metallurgy, chemistry, or the managerial functions. Such an institution enjoys the advantage of having at its disposal a wide range of equipment which our small faculties of engineering, in either university or technical college, cannot possibly acquire. These technological institutes resemble the universities in possessing facilities for research both by the teaching staff and by post-graduate students. This makes possible the recruitment of staff of a calibre which cannot be attracted to our own technical colleges, where research, if carried out at all, is confined to spare-time effort by the staff in vacation, often with less than the minimum equipment for efficient work.

The Employment of Metallurgists

One of the most illuminating surveys of the state of scientific engineering training in this country, compared with other industrial countries, was made by Hutton [14] in 1947. According to this, the pre-war annual output of honours

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* Abridged version of Chairman's Address to the Birmingham Local Section of the Institute of Metals, delivered on 6 April 1950.

† Assistant Research Manager, Imperial Chemical Industries, Ltd., Metals Division, Birmingham.

graduates in Great Britain included about 400 chemists and only 20 metallurgists, although this disparity has since been greatly reduced. By contrast, the metallurgical industries of this country are some three or four times the size of the chemical industries. A direct comparison of this kind may, however, be misleading, for chemists are employed in almost every industrial field, including the metallurgical; indeed many chemistry graduates turn their hand to metallurgy, while the number of industries based on chemistry extends far beyond the chemical industry itself. Furthermore, many chemistry graduates finally enter the teaching profession.

The various careers open to metallurgists in this country, with special emphasis on industrial employment, have been summed up in a booklet prepared by the Joint Committee on Metallurgical Education.[15] A corresponding publication issued by the American Society for Metals is worthy of study [16] for its detailed information and attractive original style of presentation.

The more important callings open to the metallurgist include teaching, research, and management. While teaching will be mainly in a university or technical college, research and executive positions alike may be held either in government or official organizations, or in industry.

The need for a great intake of university-trained men for both research and management functions was emphasized in the report of a committee of the Federation of British Industries published in 1943.[17] It seems probable that this can be met in some part by the employment of chemists and physicists, as well as metallurgists; for an industrial body will be the richer and wider in scientific outlook if there is some variety in recruitment; while essentially non-metallurgical firms may benefit by the addition of trained metallurgists to their staff. Sir Arthur Smout, lecturing to the Institution of Metallurgists,[18] pointed out the opportunities for the metallurgist in industry, and advised those with a predominantly academic background to consider at a relatively early age the possibilities of factory management. It is indeed true that the more deeply engrossed a man becomes in scientific and academic subjects, the smaller is the chance that he will be prepared to abandon such a career for management. On the other hand, the scientist who transfers to the management side must realize that while his training gives him valuable appreciation of the scientific outlook and of the technical aspects of the subject, he will no longer have the opportunity, facilities, or organization necessary for the detailed study of working processes, and that this must be left to his colleagues in the laboratory. Failure to recognize this fact is one of the most frequent causes of friction, and it cannot be too strongly emphasized that the ability of the scientist to improve manufacturing methods lies not in superior brains or knowledge, but in having the time and equipment at his disposal for the study of works' problems, unfettered by managerial responsibility.

The university graduate who enters the technical or executive side of industry will find that the complexity of modern business is such that a great deal of paper work is necessarily involved. It is therefore of the utmost importance that he should be able to prepare a document on any subject at issue. The ability to do so must begin with academic training and will, indeed, be required in some measure to pass a university examination, where, however, the writer has the advantage of preparing a scientific treatise to be read by scientists. In industry he will find it necessary to adjust his style and method to his audience. The ability to assemble information in such a way that it can be read and understood easily and quickly by a variety of people of different mentality, intelligence, and outlook, is one not readily acquired. It is nevertheless vital to successful administration at every level.

Professional Organizations

The status of a profession is influenced in no small measure by the efficiency of its professional organization and the quality of its official publications. The Institute of Metals and the Iron and Steel Institute act as the publishing bodies for metallurgical research in this country, and have achieved a world standing second to none. The Institution of Metallurgists, which represents the unified professional interests of both ferrous and non-ferrous metallurgists, has barely completed its formative period, but is already sufficiently representative to make its opinion felt in the field of metallurgical education and training. Under the able guidance of its leaders we can look forward to a steady development in the status and influence of metallurgists. To both publishing and professional bodies the support of every practising metallurgist is essential if they are to carry out in an efficient manner the work for which they were created. The older, more highly organized bodies derive great strength from a large professional membership, and if equal loyalty were to be accorded, it would be a powerful factor in raising the metallurgical profession to a comparable status.

Comparison of published salary statistics for chemists [19, 20] and for metallurgists,[21] shows that in corresponding age groups, the salaries of metallurgists are somewhat higher. However, membership of the Institute of Chemistry probably embraces a larger and more representative cross-section of the profession, with a significant proportion of teacher members, so that the average salary level is depressed in both low and high age groups. American statistics indicate substantially higher salaries (with, of course, a higher cost of living), but an important difference is the steeper grading of pay scales between the top and bottom of the promotion ladder. Undoubtedly, the metallurgist enjoys a higher reputation and standing in America than he has yet attained in this country.

The structure of other professional societies [22–25] could usefully be examined by metallurgists, who are only just beginning to develop a consciousness of professional unity. Generally speaking, the older professions, such as medicine and architecture, are organized in such a way as to be able to carry out a variety of functions, including education, supervision of standards of qualification and status in the profession, and the publication of journals. In the medical profession the qualifying bodies are the Royal College of Physicians, the Royal College of Surgeons, &c., and the registering body is the General Medical Council, while there are various publishing bodies dealing with different branches of medicine.[22] The legal [23] and architectural [24] professions are equally complex. The latter is of special interest in having a central body, the Royal Institute of British Architects, and a number of associated bodies both in this country and in the Dominions. The parent institution alone has the power to qualify and register architects: while by a charter granted in 1938 no one may describe himself as an architect unless he is qualified by the R.I.B.A. Several professions involve membership of, and maintenance of subscriptions to, the registering institution, for the continuance of professional status and the right to practise. This, incidentally has the advantage that the annual subscription is admitted for relief from income tax, unlike our own optional sub-

scriptions. Neither the Royal Institute of Chemistry nor the Institution of Metallurgists has yet claimed the rights over its members imposed in the older professions; but without exercising the same authoritative powers of negotiation the Royal Institute of Chemistry has been able to influence considerably the standing and salary levels of its members holding Government and other public appointments.

Public Opinion

That scientists should receive a proper education in the humanities has been stressed by many writers and recognized in some university faculties. It is, however, equally important that the non-scientist should have some understanding of scientific thought and method; otherwise, research will be carried on in a scientific vacuum. The daily press, by generally stressing the sensational and by exaggerating facts to attract attention, exercises an influence that is the reverse of scientific, with the result that the popular idea of the scientist is too often confused with that of the inventor, while scientific method is barely differentiated from semi-magical displays.

A welcome contrast has been provided by some recent B.B.C. programmes for non-scientific listeners, that have been couched in terms which are simple and easy to follow, but which succeed in conveying the nature of scientific research in its true perspective, without sensational and misleading claims. It is probably true, however, that a large proportion of those who have made their career in science are too closely concerned with their own narrow sphere of knowledge to be able, or willing, to write about their subjects in a way that the layman can understand.

The technical colleges and universities have done much to provide adult education in the arts, but little in the sciences.[26] The British Association has attempted to remedy this position and in 1948 it established a committee to consider the possibility of further adult education in science; the report of this committee was discussed at the 1949 meeting of the British Association.[27] This has led to a welcome increase in extra-mural lectures sponsored by the universities. Our own professional bodies might well consider going outside the small groups of scientists and technologists with whom they are normally concerned to organize and prepare interesting and informative lectures for the greater, non-scientific public. Some such dissemination of knowledge on the physical sciences would be especially welcome, for in most large towns few lectures are given on chemistry, physics, or metallurgy, though those on natural history and biology are well attended.

In recent years the Royal Institute of Chemistry has arranged Christmas lectures to school children in various centres, including Birmingham, thus emulating under more modest conditions the well-known activities of the Royal Institution. More recently, also, lectures on chemistry as a profession have been given to children in their final year at secondary schools in a few large industrial cities.[28] It is even more important that metallurgists should follow this example, if metallurgy is to draw upon the best material for its students, since its potentialities as a career are so much less well known.

The exhibition "Metals in the Service of Mankind", organized by the Institution of Metallurgists at the Science Museum, South Kensington, in 1950 proved a valuable means of introducing the science of metallurgy to a wider public. Other positive steps are, however, necessary, especially in the provinces, to increase the public's understanding of, sympathy for, and appreciation of the metallurgist's work.

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LETTERS TO THE EDITOR

The Density of Metals and Dislocations

The publication of a paper by Snoek,[1] entitled " Density Variations in Aluminium ", prompts the consideration of an observation in this field which appears to have been forgotten. Snoek found that heat-treatment of the metal to increase the crystal size from <1 up to 6 mm. in dia. caused a definite increase in density, and he concluded that grain boundaries in aluminium have a much more spacious structure than is generally supposed. A rise of density with increase of crystal size has previously been observed by Kaya [2] for iron, nickel, and aluminium, and by Ishigaki [3] for iron, but the contrary effect was noted for lead by Hiers [4] and for aluminium by Hanson and Wheeler.[5]

When a polycrystalline aggregate free from cavities is heavily cold-worked, there is considerable evidence to show that its density is slightly reduced. What appears to have been forgotten is that the density of a single crystal remains unchanged in this respect. The original observation of O'Neill [6] for silicon-iron was confirmed for decarburized iron by Pfeil,[7] and by Gough, Hanson, and Wright [8] and by Hanson and Wheeler [5] for aluminium.

The theoretical implications of this observation should be of value in connection with the modern theory of dislocations. The fall in density of worked aggregates was attributed by Beilby to the formation of amorphous or vitreous metal, but this explanation should give a similar effect in a single crystal. Honda [9] has suggested that when cold working develops internal stress in a polycrystalline aggregate, the compressions produce less contraction of the space lattice than the tensions cause expansion, so that there is a net increase of volume. Even though a deformed single crystal is free from the restraint of surrounding grains, there is no reason to suppose that it may not contain internal stresses. Tammann [10] believed that metals contained (*a*) gaps between the grains, (*b*) " space canals ", and (*c*) loosening at glide surfaces produced by block slips, so that Sachs [11] attempted to explain O'Neill's results on these grounds. Zener [12] has decided that cold working produces lattice distortion, and calculated that this will always produce a slight increase in volume. If so, it is difficult to see why the same result should not apply to a single crystal.

It would be interesting to have the opinion of the dislocation experts on this general phenomenon. Do they believe that vacant lattice sites [13] and regions of misfit accumulate in cold-worked aggregates but evaporate in deformed single crystals? We suggest that in an aggregate the dislocations become trapped at grain boundaries during cold working and form low-density assemblies, whereas in single crystals many of them escape to the surface. The others produce strain-hardening—even though Tammann always taught that a free single crystal showed no increase in scratch hardness on straining. Our suggestion made above is comparable with observations [14] made on the creep behaviour of a zinc crystal before and after copper plating.

A useful experiment might be to determine the density of a metal crystal, coat it with a polycrystalline electrodeposit, subject it to heavy strain, and then redetermine the density after removal of the coating.

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Determination of Iron in High-Nickel Alloys

Methods for the determination of iron have been seriously studied only in recent years, when the trend has been to make more and more highly alloyed materials instead of the old plain carbon or low-alloy steels.

In many cases a good rapid method is desired for determining iron in highly alloyed materials such as that containing

C	Mn	Si	W	Mo	Ni	Cr	Cu
0·30%	0·10%	1%	3%	3%	52%	25%	3%

Fe remainder.

Ordinary methods for determining iron in such an alloy are lengthy and subject to difficulties, but the method described below is simple to operate and one determination, which used to take at least a whole day, can be accomplished in about 1 hr. or less. In addition, the method is applicable to most alloys.

The apparatus required consists of a photoelectric absorptiometer, with suitable glass cells, 4 cm., 2 cm., 1 cm., &c. (The instrument recommended is the Hilger " Spekker ".)

Solutions used are: (*a*) " Spekker acid " made by adding to 200 ml. of water 60 ml. concentrated sulphuric acid and 60 ml. phosphoric acid, cooling, and diluting to 400 ml.; and (*b*) Thioglycollic solution made by diluting 50 ml. thioglycollic acid to 500 ml.

The method is as follows: a 0·5-g. sample of alloy is weighed into a 600-ml. conical beaker, and dissolved in 30 ml. of aqua regia; 30 ml. of " Spekker acid " are added and the solution is evaporated to fumes. After cooling slightly, 60 ml. of water are added and the beaker heated to redissolve the residue.

When solution is complete, the beaker is cooled and the contents diluted to 500 ml. in a graduated flask.

A 50·0-ml. fraction is taken and diluted to 500 ml. in a graduated flask after addition of 20 ml. of 50% citric acid. Two 50·0-ml. fractions (*A* and *B*) are then taken and to each is added 10 ml. of 50% ammonia. To *A* is then added 10·0 ml. of thioglycollic solution from a burette.

Both fractions are diluted to 100·0 ml. in graduated flasks and their absorption values read (setting W-W 1·20, mercury vapour lamp, Ilford 605 filters), the difference in the readings being a measure of the amount of iron present. For 0–8% Fe 4-cm. cell is used, and for 8–16% Fe 2-cm. cell, &c.

A graph is constructed using pure iron under the conditions described above, and covering the range required. From such a graph the percentage of iron in the sample can be calculated from the absorption values.

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NEWS OF LOCAL SECTIONS AND ASSOCIATED SOCIETIES

Scottish Local Section

The meeting held on 10 December 1951 in Glasgow took the form of a Symposium on:

Metal Testing

The subject was introduced by the Chairman (Mr. JOHN ARNOTT), who outlined the very wide range of tests carried out on metals at various stages of manufacture, to provide information for the designer, manufacturer, and user. Mr. J. M. MOWAT, of William Beardmore and Co., Ltd., then spoke on the uses and significance of the orthodox tests for material quality, and afterwards Dr. H. HARRIS, of Babcock and Wilcox, Ltd., introduced the subject of non-destructive testing and outlined the radiological and ultrasonic methods of locating defects. The discussion, in which several visitors took part, ranged over many aspects of testing practice.

Sheffield Local Section

At a joint meeting of the Section with the Sheffield and North-East Centre of the Institute of Metal Finishing on 7 December 1951, Mr. H. G. DALE, Chief Chemist to the Sheffield Smelting Co., Ltd., gave a lecture on:

The Precious Metals in Industry

The paper dealt with gold and silver and the six platinum metals. The general characteristics of the metals were described, and then each metal was treated individually, the source and extraction being briefly described and figures of world production given. The uses in the pure state and in its various commercial alloys of each metal were fully dealt with, examples being the use of gold and silver alloys for coinage; the use of silver and its alloys for solders and of silver salts for photography; and the use of the platinum metals for electrical contacts and as catalysts for various purposes. A section of the paper was devoted to the plating industry, and details were given of suitable plating baths for the various metals.

South Wales Local Section

At a meeting held at University College, Swansea, on 4 December, 1951, Mr. R. W. RUDDLE, of the British Non-Ferrous Metals Research Association, lectured on:

The Solidification of Castings

The lecture began with a discussion of the methods available for the study of the solidification of castings, the advantages of the temperature-measurement method being emphasized. The different modes of solidification were described of pure metals and certain eutectic alloys on the one hand and of long-freezing-range alloys on the other. Pure metals freeze by "skin formation", but long-freezing-range alloys solidify in a "pasty" manner. Recent work carried out at the B.N.F.M.R.A. and elsewhere, which has explained these differences in the mode of solidification, were discussed. The properties of nuclei capable of initiating solidification were considered, and the role of nuclei and concentration gradients in the production of fine-grained cast structures was mentioned. Recent work on the grain refinement of aluminium alloys was described.

Research carried out at the B.N.F.M.R.A. on the kinetics of solidification was reviewed in the second part of the lecture. Measurements of the rate at which a sand mould heats up after the casting has been poured enable the thermal properties of the sand to be deduced and the rate at which the mould extracts heat from the casting to be computed. Measurement of the temperatures at various points within solidifying castings enables the progress of solidification to be followed and to be correlated with the extraction of heat by the mould. The way in which the rate of solidification affects the soundness and strength of castings was described.

The lecture concluded with a discussion of the aims and practical importance of research on the solidification of castings.

JOINT ACTIVITIES

Mond Nickel Fellowships

The Mond Nickel Fellowships Committee announces the following additional award for 1951:

MR. P. J. HILL (Public Works Department of Western Australia) to study in the United Kingdom the application of research to the development of corrosion-resistant metals for use in the mechanical-engineering industry.

OTHER NEWS

The Measurement and Importance of the Elastic Properties of Metals

It is proposed to hold a conference on this subject at the National Physical Laboratory, Teddington, Middlesex, on 20 and 21 March 1952. Experts from as many different laboratories as possible are being invited to contribute papers. The conference will be of an informal nature, and the numbers of those attending will be limited to about 100, by personal invitation.

Members who would like to receive an invitation are requested to notify the Secretary of the Institute of Metals to that effect.

Proposals for the first day of the meeting include: reviews of static low-frequency and high-frequency methods of measurement of elastic constants; a summary of available data; and the results of some recent measurements at the N.P.L.

For the second day the proposals include: the origin of elastic properties in the interatomic forces; X-ray diffuse scattering and its correlation with elastic constants; the role of elastic constants in the energy changes in crystals; the relations between elastic and plastic behaviour; and analogies with the behaviour of structures.

Summer School on Welding Design and Engineering

A Summer School on Welding Design and Engineering will be held by the British Welding Research Association at Ashorne Hill, Warwickshire, from Wednesday 16 July to Friday 25 July 1952. Further details may be obtained from the Association, 29 Park Crescent, London, W.1.

H. W. Gillett Memorial Lecture

The American Society for Testing Materials has announced the establishment of an annual H. W. Gillett Memorial Lecture. The purpose of this lecture, which is being sponsored in co-operation with Battelle Memorial Institute, is to commemorate Horace W. Gillett, who was one of America's leading technologists and the first Director of Battelle in Columbus, O.

The memorial lecture will be delivered annually at a meeting of the Society, the first to be given at its 50th Anniversary Meeting in New York City during the week beginning 23 June 1952. The lecturer, who will be selected through a committee appointed by the Society's Board of Directors, will cover a subject pertaining to the development, testing, evaluation, and application of metals.

DIARY

Local Sections

5 February. Oxford. "The Non-Destructive Testing of Metals", by C. Croxson. (7.0 p.m.)

5 February. Sheffield. "Casting of Billets, with Special Reference to Continuous Casting", by Dr. E. Scheuer. Joint Meeting with the Sheffield Metallurgical Association. (Grand Hotel, Sheffield, at 7.0 p.m.)

5 February. South Wales. "Historical Developments of Tube Manufacture", by G. R. Goldsworthy. (Metallurgy Department, University College, Singleton Park, Swansea, at 6.30 p.m.)

7 February. Birmingham. Debate: "That in the opinion of this House further encroachment of Metal Physics into the courses of instruction would be detrimental to training in Metallurgy". Opening speakers: Dr. J. W. Jenkin and Mr. H. W. G. Hignett. (James Watt Memorial Institute, Great Charles Street, Birmingham 3, at 6.30 p.m.)

7 February. London. "Chromium and Chromium-Rich Alloys", by Dr. A. H. Sully. (4 Grosvenor Gardens, London, S.W.1, at 7.0 p.m.)

11 February. Scottish. To be arranged. (39 Elmbank Crescent, Glasgow, C.2, at 6.30 p.m.)

28 February. Birmingham. "Metallurgical Research in the U.S.A.", by Professor C. S. Barrett. (James Watt Memorial Institute, Great Charles Street, Birmingham 3, at 6.30 p.m.)

29 February. Birmingham. All-Day Symposium on "New Techniques of Metallurgical Research", to be opened by Professor A. G. Quarrell. (Birmingham College of Technology, at 10.30 a.m.)

Other Societies

5 February. Institute of Metal Finishing, Midlands Centre. "Plating Plastics", by D. McPherson. (James Watt Memorial Institute, Great Charles Street, Birmingham 3, at 6.30 p.m.)

6 February. Manchester Metallurgical Society. "The Continuous Casting of Steel", by J. Savage. (Engineers' Club, Albert Square, Manchester, at 6.30 p.m.)

7 February. Leeds Metallurgical Society. "The Low-Temperature Properties of Metals", by D. W. Naylor. (Chemistry Department, The University, Leeds 2, at 7 p.m.)

8 February. Liverpool Metallurgical Society. "Some Technical and Economic Problems in the Conservation of Fuel", by Professor A. L. Roberts. Joint Meeting with the Society of Chemical Industry. (Old Chemical Lecture Theatre, The University, Brownlow Street, Liverpool, at 7.0 p.m.)

11 February. Institute of Metal Finishing, Midlands Centre. "How to Use Electroplating to the Best Advantage", by A. W. Wallbank and C. Wharrad. Joint Meeting with the Wolverhampton Engineering Society. (Victoria Hotel, Wolverhampton, at 7.30 p.m.)

18 February. Institute of Metal Finishing, London Centre. "Some Physical and Thermal Properties of Chromium Deposits", by E. S. Spencer-Timms. (Northampton Polytechnic, St. John Street, London, E.C.1, at 6.0 p.m.)

19 February. Institute of British Foundrymen, East Anglian Section. Symposium on Sand Control. (Public Library, Ipswich, at 7.0 p.m.)

19 February. Institute of British Foundrymen, Slough Section. "The Control of Grain-Size in Non-Ferrous Castings", by A. Cibula. (Lecture Theatre, High Duty Alloys, Ltd., Slough, at 7.30 p.m.)

20 February. Manchester Metallurgical Society. "Extrusion", by J. Crowther. (Engineers' Club, Albert Square, Manchester, at 6.30 p.m.)

21 February. Institution of Mining and Metallurgy. General Meeting. (Geological Society, Burlington House, Piccadilly, London, W.1, at 5.0 p.m.)

22 February. North-East Coast Institution of Engineers and Shipbuilders. "Application of Aluminium to Ship Constructions", by E. C. B. Corlett. (Mining Institute, Neville Hall, Newcastle-upon-Tyne at 6.15 p.m.)

22 February. West of Scotland Iron and Steel Institute. "Metallurgical Application of Radioactive Tracers", by Dr. H. M. Finniston. (39 Elmbank Crescent, Glasgow, C.2, at 6.45 p.m.)

27 February. Institute of British Foundrymen, London Branch. "Investment Casting", by G. A. Tomkinson. (Waldorf Hotel, Aldwych, W.C.2, at 7.30 p.m.)

29 February. Institute of Metal Finishing, Sheffield and North-East Centre. Address by Dr. S. Wernick. (Grand Hotel, Sheffield, at 6.30 p.m.)

APPOINTMENTS VACANT

AN EXECUTIVE POST is open for a melting-furnace engineer with selling experience and preferably with some knowledge of electric furnaces. The position offers considerable scope, and only first-class men need apply. Applications in confidence to Box No. 328, Institute of Metals, 4, Grosvenor Gardens, London, S.W.1.

CHEMIST, with University qualifications, required for important inorganic chemical research in a modern laboratory in North London area. Experience or interest in ceramics, mineralogy, or welding fluxes an advantage. Opportunities and working conditions are excellent. Salary £600–£900. Write Box JIM 399, L.P.E., 110, St. Martin's Lane, W.C.2.

EXPERIENCED METALLURGIST required for research dept. in North West area. Must have personality and ability to control Inspection Section, as well as technical qualifications of normal average calibre. Permanent position. Apply Box No. 324, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

FOUNDRY in S.W. suburban London require energetic young man (about 28 or 30) with metallurgical or technical foundry training to take charge as foreman in small non-ferrous department where a wide variety of alloys is used. Apply Box No. 320, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

METALLURGICAL CHEMIST required to establish works laboratory in modern factory in South Wales for control of raw materials, investigation into production problems, development of new processes. Experience in analysis of non-ferrous metals, plating, finishing, and heat-treatment processes, including anodizing, is essential. Post offers scope for initiative and carries good salary, with pension scheme. Box No. 329, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

METALLURGIST required for investigations on non-ferrous alloys in Research Division of Laboratory attached to Founders in the London Area. Applicants should have a good degree in metallurgy or equivalent qualifications, or alternatively, a degree in physics or chemistry with metallurgical experience. Salary according to qualifications and experience. Write to Box No. 316, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

METALLURGIST. Senior Assistant required by William Mills, Ltd., Aluminium Founders, Friar Park Road, Wednesbury. Experienced in light alloys and foundry work: knowledge of X-ray procedure an advantage: age preferably about 30. Replies, in confidence, to Managing Director.

METALLURGIST with experience in melting and working of non-ferrous metals required to take charge of production in London area. Honours degree or A.I.M. Salary not less than £750 p.a. Reply to Box No. 325, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

METALLURGIST, with University qualifications, required for development work on light alloy welding in Metallurgical Research Department in North London area. Preference given to applicant with some industrial experience in light alloy welding or founding. Salary £600–£850. Write Box JIM 400, L.P.E., 110, St. Martin's Lane, W.C.2.

METALLURGIST, with University qualifications, age 21–27, required for X-ray crystallographic section of modern Metallurgical Research Department in North London area. Some research experience desirable. Attractive salary. Apply by letter to Research Manager, Murex Welding Processes Ltd., Waltham Cross, Herts.

RESEARCH LABORATORIES of The General Electric Co., Ltd., North Wembley, Middlesex, require a graduate with a good Honours degree in Metallurgy and with a few years' research experience for a responsible position in a group concerned with magnetic materials. Age preferably 27–35. Apply to the Staff Manager (Ref. GBLC/O/403) giving details of age, qualifications, and experience.

RESEARCH ORGANIZATION dealing with light metals requires Physical Chemist, preferably with a higher degree, to supervise work of analytical, finishing, and corrosion sections. Experience in light metals an advantage but not essential. Box No. 327, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

RESEARCH ORGANIZATION in the South Midlands dealing with light metals requires a Senior Investigator to take charge of Section working on melting and casting. Some experience in ingot-casting processes and in heat-transfer problems would be an advantage. A Junior Investigator, to form part of the same team, is also required. Salaries in both cases would be commensurate with qualifications and experience. Box No. 326, Institute of Metals, 4 Grosvenor Gardens, London, S.W.1.

SENIOR METALLURGIST required to take general charge of research on bearing metals, bronze, and other alloys containing tin. Industrial experience an advantage. The post is one of responsibility and will be suitably remunerated. F.S.S.U. superannuation. Applications to be sent to The Director, Tin Research Institute, Fraser Road, Perivale, Greenford, Middlesex.

TECHNICAL ASSISTANT required for Metallurgical Research Dept., experience in metallurgy of light alloys essential and possession of Higher National or equivalent certificate desirable. Age about 21–23. Apply in writing with full particulars to, Secretary, Magnesium Elektron, Ltd., Lumm's Lane, Clifton Junction, Nr. Manchester.

THE MOND NICKEL COMPANY invites applications from graduate metallurgists for two vacancies on the staff of its Research Laboratory in Birmingham. Apply, with full particulars of qualifications, experience, age, salary required, &c., to the Manager, Development and Research Department, The Mond Nickel Co., Ltd., Sunderland House, Curzon Street, London, W.1, marking the envelope " Confidential L.15 ".

WESTERN AUSTRALIA. Applications are invited for appointment to the position of Lecturer in Secondary Metallurgy at the Technical College, Perth, Western Australia.

Applicants should hold a University Degree or Diploma in Metallurgy and have had considerable industrial experience in Secondary Metallurgy since graduation.

The duties of the appointee will include the control and development of his Department, lecturing (within his field) in the subjects of a Diploma of Metallurgy. He will also be required to undertake and direct research in industrial problems; this latter activity will be conducted in association with the State Government Department of Industrial Development.

The appointment will be in the range of £A820–940 (Assistant Lecturer) or £A970–1050 (Lecturer) according to qualifications and experience, plus basic wage allowance at present £102. Sea transport will be arranged for the successful applicant and family on his undertaking to serve the Department for a period of at least three years. Accommodation in a newly-established housing estate will be made available.

Applications (in quadruplicate and including recent photograph) giving age and particulars of general and technical qualifications, teaching experience, and period required to arrange for departure, should be addressed to Secretary, Agent General for Western Australia, Savoy House, 115–116, Strand, London, W.C.2, from whom further particulars as to conditions of employment, &c., in Perth may be obtained, and should reach him not later than 28 February, 1952.

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